

**WERS 2004 Information and Advice Service
Technical Paper No. 3**

**Linking the Annual Survey of Hours and Earnings to the
2004 Workplace Employment Relations Survey**

**A technical discussion with an illustrative analysis of the
gender pay gap**

Rhys Davies and Richard Welpton,

Micro-data Analysis and User Support
Office for National Statistics

Details for Correspondence

E-mail: Richard.welpton@ons.gov.uk Tel: +44 (0) 01633 455359

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Part 1: Linking Workplace Characteristics from WERS 2004 on to the Annual Survey of Hours and Earnings

1.1 WERS2004

The 2004 Workplace and Employment Relations Survey (WERS 2004) is the fifth in a series of surveys that collect information about the state of employment relations in workplaces throughout Britain. The purpose of the WERS is to provide a statistically reliable account of British workplace relations in order to examine and track changes in those relations over time. Respondents in approximately 2300 workplaces were interviewed for WERS 2004. The survey is conducted in 4 parts. The majority of the data is collected from the senior manager at the workplace who has responsibility for personnel or employment relations issues (referred to as the Cross Section Management Questionnaire). Data is also collected from questionnaires issued to employee representatives, employees and financial managers¹.

The WERS 2004 survey collected information on the following topics:

- Composition of the workforce
- Management of personnel, employment relations, and employee representation
- Work organisation
- Workplace flexibility
- Employee representation
- Payment processes
- Wage determination
- Grievance and disciplinary procedures
- Equal opportunities
- Workplace performance

The scope of WERS 2004 extends to cover all workplaces in Great Britain with 5 or more employees and operating in Sections D-O of the *Standard Industrial Classification (2003)*. The survey covers workplaces in both private and public sectors. The principal unit of analysis is the establishment or workplace. A workplace is defined as comprising the activities of a single employer at a single set of premises.

An important innovation in the WERS 2004 survey was that respondents to the Management Questionnaire were asked whether the data that had been collected during the WERS survey could be linked to other surveys or datasets to which researchers had authorized access. Assurances were given to respondents regarding the confidentiality of the linked data and that the linked data would be anonymous and used only for statistical or analytical purposes. Of the 2295 workplaces interviewed for the WERS survey, 2166 (approximately 94 percent) agreed that the data collected in WERS could be linked with other surveys or datasets. As a result, the WERS 2004 data has been deposited within the Virtual Micro-data Laboratory

¹ Further information on WERS 2004 is available at: <http://www.wers2004.info>

(VML) at ONS to facilitate linking with the other ONS business data sets that are available within the VML².

1.2 Annual Survey of Hours and Earnings

The Annual Survey of Hours and Earnings (ASHE) was introduced in 2004 to replace the New Earnings Survey (NES), which was conducted annually since 1970. The ASHE is the largest regular survey of pay in Great Britain, with data being provided for on approximately 160,000 employees. The survey is conducted in April of each year, based upon a 1% sample of employees selected on the basis of the last two digits of their national insurance numbers. The survey contains detailed information on individuals' working hours, hourly and annual earnings, overtime payments, pension contributions and collective agreements. Information on employees is provided directly by employers from their administrative records and is therefore likely to be more accurate than earnings information collected from other sources that rely on self-reporting by employees. Unlike the NES, the ASHE includes data on individuals working for firms that are registered for VAT only as well as for PAYE, and also data on individuals entering the job market between the sample selection date and the sample reference period.

1.3 The Rationale for Matching WERS to ASHE

WERS is a comprehensive survey focusing on a variety of workplace practices, including recruitment, disciplinary procedures, employee representation and establishment performance. Selected employees at workplaces are also interviewed for a separate WERS employee survey. Data are collected on wages and hours. Information on human capital characteristics is also gathered. However, data concerning wages are limited, with employees only being asked to provide details of their hourly and weekly wages within banded categories. Whilst it is possible to analyse these data within a multivariate framework by employing the interval regression methods first proposed by Stewart (1983), continuous data would clearly be preferable; however, questions asking for detailed information on wages typically elicit high rates of non-response in voluntary surveys. ASHE is a large and mandatory survey containing detailed information on the hours and earnings of employees. However, it contains relatively little information on workplace characteristics. The purpose of a merged dataset is therefore to expand upon the information contained within the ASHE data set, combining the detailed information about the hours and earnings of individuals with additional information about the characteristics of the workplaces where these employees work.

1.4 Methodology for Matching WERS to ASHE

The ASHE-WERS data set has been constructed by combining information on individuals contained within the 2004 ASHE data set with workplace information collected from the WERS 2004 Management Questionnaire. For each individual, the ASHE data contains a unique IDBR³ enterprise reference number and the postcode of

² The VML is also being used as the *de facto* home for WERS data containing detailed geographical information of the workplaces who participated in the survey.

³ The Inter-Departmental Business Register is the key sampling frame used in ONS business surveys. IDBR reference numbers enables enterprises to be linked both across surveys and over time.

the workplace where the subject is employed. The IDBR was also used as the sampling frame for WERS 2004 and therefore IDBR reference numbers at the level of the enterprise and workplace are also available on the WERS data set deposited in the VML. Whilst enterprise reference numbers in ASHE uniquely identify enterprises, they do not uniquely identify workplaces within multi-site enterprises. To match ASHE to WERS, the WERS research team also provided workplace postcodes on the data deposited within the VML⁴. Information from ASHE and WERS could therefore be matched based upon a combination of enterprise reference numbers and workplace postcodes. The merged data set contains information on 5,922 individuals.

It is noted that some individuals from ASHE within the matched data set will work within the same WERS workplace. As such, the information relating to one particular workplace from WERS will be merged on to multiple subjects in ASHE. The results of the matching exercise are summarized in Table 1 below. Approximately one third of the workplaces surveyed in the WERS have been matched to one or more employees in ASHE. In the lower half of Table 1, it can be seen that of the 785 matched workplaces, 253 are matched to only a single ASHE employee. In contrast, 10 workplaces in WERS are each matched to more than 50 ASHE observations (employees).

Table 1: Workplaces Matched to ASHE Data

	Frequency	Percentage of total WERS workplaces
Matched to ASHE record	785	34.2
Consented but no match	1381	60.2
Did not consent	129	5.6
Total	2295	100
Of those workplaces where there is a match to ASHE		
Number of ASHE Observations		
1	253	32.2
2	128	16.3
3-5	159	20.3
6-10	83	10.6
11-50	152	19.4
51+	10	1.2
Total	785	100

The linking procedure assumes that combinations of enterprise reference numbers and postcodes in ASHE uniquely identify workplaces. The procedure would not be appropriate if an enterprise had separate local units located at the same postcode. To consider this we test for the presence of multiple local units within the ASHE data set that have the same combination of enterprise reference number and same postcode. We find that within almost all enterprises included in the ASHE data (99.9%), only a single workplace is shown to be present at a particular postcode.

⁴ It is noted that as part of the terms and conditions of the WERS survey, this provision of detailed geographical information only became possible after April 2007.

Finally, it should be noted that it is **not** possible to match ASHE records with individual responses from the WERS Survey of Employees because the respondents to the WERS Employee Survey are anonymous and cannot be identified. Furthermore, those individuals in ASHE whose details have been matched to a particular workplace in WERS are not necessarily the same people who responded to the WERS Employee Survey.

1.5 Assessing the Representativeness of the Matched Sample

The above discussion has focused on the nature of links made between the ASHE and the WERS data sets. We now consider the characteristics of the matched data set compared to the two original data sources. In the first instance, we assess how the subset of WERS workplaces that have matching ASHE records compares with the full sample of WERS records. This assessment is relevant for any potential analyses of the linked dataset in which the workplace is the unit of analysis. Table 2 shows the proportion of workplaces in WERS that are linked to one or more ASHE records in the matched data set. Most significantly, it can be seen that larger workplaces in WERS are more likely to be linked to ASHE, with 70% of WERS workplaces employing 1000+ employees being able to be linked to an ASHE subject. This is to be expected, since very small workplaces (those with fewer than 5 employees) are excluded from WERS 2004 and, more generally, because large workplaces employ a disproportionate share of all employees. The prevalence of larger workplaces in certain industries such as utilities and manufacturing also means that workplaces in these industries are over-represented in the matched data set.

Table 2: Proportion of WERS workplaces matched to ASHE

	Workplaces	% Matched to 1 or More ASHE Observations
Size		
1 to 20	571	7.0
21 to 50	425	14.2
51 to 100	301	31.6
101 to 500	584	50.9
501 to 1000	170	64.1
1001+	244	70.1
Sector		
Manufacturing	344	43.9
Utilities	11	54.5
Construction	113	25.7
Retail	432	20.8
Finance/IT	201	32.8
Leisure	107	23.4
Transport	144	48.6
R&D	7	57.1
Business Services	202	22.8
Public Sector	734	40.6
Total	2,295	34.2
	(100%)	

In the second instance, we assess how the subset of ASHE employees that have matching WERS records compares with the full sample of ASHE records. This assessment is relevant for any potential analyses of the linked dataset in which the employee is the unit of analysis (as in our illustration in the second part of this paper). Due to the relative size of the two surveys, the number of employees in the matched ASHE/WERS data set is much smaller than the number of employees contained in the full ASHE sample for 2004. The sample of 5,922 individuals in the matched dataset represents approximately 3.6 percent of the total number of individuals contained in the ASHE data. Table 3 compares characteristics of individuals contained in the matched data set with those in the full ASHE sample in terms of selected variables from the ASHE data. It can be seen that, on average, those in the matched data set have higher earnings, are more likely to have an employer provided pension and are more likely to have their pay set by collective agreement. These observations clearly relate to the fact that employees in the matched data set are much more likely to work in the public sector, both within central government and within local authorities.

As a final examination of the matched data, we compare the distribution of hourly earnings derived from three data sources; the WERS employee survey; the ASHE sample; and the matched ASHE/WERS sample. Respondents to the WERS employee questionnaire are asked to provide information on their weekly⁵ earnings, categorised according to one of fourteen banded categories. Respondents are also asked to provide information about their usual weekly hours. Estimates of hourly earnings from this source have therefore been estimated by dividing the mid-points of these bandwidth categories by total reported hours worked.

Table 4 compares the distribution of hourly earnings derived from the 3 data sources. It can be seen that estimates of average earnings are relatively similar when comparing the full WERS and ASHE samples. Whilst average hourly earnings in ASHE are £10.77, hourly earnings in WERS are estimated to be slightly higher at £11.52. The distributions of hourly earnings in these two data sets are also similar. The distribution of hourly earnings in the matched ASHE/WERS sample is however skewed towards higher earners. Almost 30% of individuals in the matched sample earn more than £15.00 per hour, compared to 17-19% of individuals in the full WERS and ASHE data sets. Again, this reflects the characteristics of the matched sample, with these individuals being more likely to be employed in larger organisations and within the public sector.

Analysts using the matched ASHE/WERS data may find it productive to compute a weight which could be used in any subsequent analysis in an attempt to remove the 'match bias' shown in Table 3⁶.

⁵ Annual equivalent earnings are also provided for guidance.

⁶ A standard approach would involve entering the variables listed in Table 3 into a logistic regression on the full ASHE dataset, in which the dependent variable was coded 1 for matched records and 0 otherwise. The inverse of the predicted values from the logistic regression could then be used for weighting purposes.

Table 3: Characteristics of Individuals in the ASHE and Matched Datasets

	ASHE 2004	Matched Dataset
Gender (% female)	50.1	51.4
Age		
Mean	39.9	40.6
Median	40	40
Average total hours in pay period		
Mean	33.1	33.3
Median	37	37
% working full time hours	71.1	75
Average hourly earnings in pay period		
Mean	£10.77	£13.14
Median	£8.52	£10.98
Employer provided pension (%)	52.5	77.9
Pay set under collective agreement (%)	57.0	82.9
Enterprise employment (IDBR):		
Mean	18502	18708
Median	2314	6176
Legal status (IDBR) (%):		
Private company	60.5	44.3
Sole proprietor	2.2	0.0
Partnership	3.9	0.4
Public corporation	2.0	4.1
Central government	10.3	29.4
Local authority	14.2	9.6
Non-profit serving households	7.1	12.1
Sector		
Manufacturing	14.0	15.9
Utilities	0.5	1.1
Construction	3.8	1.5
Retail	17.2	6.3
Hospitality	4.1	0.5
Transport	6.1	9.3
Finance	6.3	6.3
Computing	1.7	1.3
Business Services	8.7	2.4
Entertainment	2.2	2.3
Public Sector	34.7	53.2
Number of observations	166794	5922

Table 4: Earnings Distributions Derived from WERS, ASHE and the Matched Sample

Hourly Pay Band	WERS⁷	ASHE⁸	Matched ASHE/WERS⁹
£0 - £5.00	11.84	10.99	4.31
£5.01 - £7.50	27.40	28.40	19.02
£7.51 - £10.00	22.35	20.17	18.44
£10.01 - £12.50	13.56	12.88	16.60
£12.51 - £15.00	7.90	8.68	12.40
£15.01+	16.95	18.88	29.23
Average Earnings	11.52	10.77	13.14

⁷ Note: 2403 individuals in the 22451 (approx 10%) sample did not answer

⁸ Sample size after dropping missing data: 161,598 (3.1 percent of observations dropped)

⁹ Sample size of merged file (after dropping missing data): 5702 (3.7 percent smaller)

Part 2: An illustrative analysis of the gender pay gap

2.1 Introduction

For a variety of reasons, including the decline of heavy manufacturing, the growth of service sector employment, the rise in educational participation and equal opportunity policies, there has been a significant increase in the participation of women in paid employment. Despite these developments, evidence of a persistent gender pay differential remains and has been extensively documented. Recent estimates of the gender gap in pay have estimated differentials of 12% (Manning and Swaffield, 2005), 17.5% (Walby and Olsen, 2002) and 18.6% (Booth et al, 2005) after controlling for other observable characteristics between men and women.

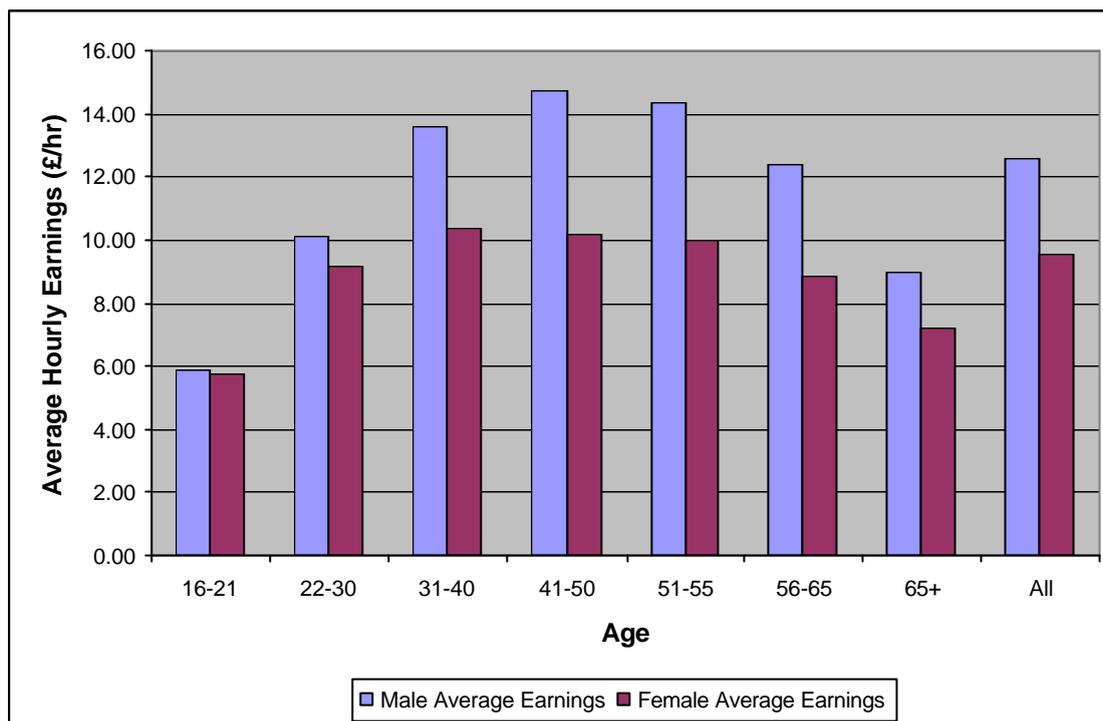
This second part of the paper investigates the impact of workplace gender monitoring and review procedures on the wages of female workers relative to males. Many medium and large organisations have adopted formal equal opportunity policies covering not only pay, but also recruitment, selection, and promotion. Many workplaces now actively monitor these areas to ensure equality is improved or maintained between female and male workers. In this paper we investigate the effect of such workplace monitoring on the gender gap in pay. To do so, we have utilised data from the 2004 Workplace Employment Relations Survey (WERS) matched to the 2004 Annual Survey of Hours and Earnings (ASHE), as described in Part One.

The remainder of this paper is structured as follows. Section 2.2 provides a brief overview of some of the main hypotheses cited to explain the presence of a gender gap in pay. Section 2.3 presents a descriptive analysis of the relative earnings of women, distinguishing those who are employed in workplaces characterised by the monitoring and review policies outlined above. Section 2.4 outlines our general empirical strategy and Section 2.5 presents the results of analysis of multivariate analysis based upon both the WERS data and the linked WERS/ASHE dataset. Section 3 concludes.

2.2 The Relative Earnings of Women and Reasons for the Gender Gap in Pay

We begin by presenting estimates of the average hourly earnings of women compared to those of men for the UK based upon data from the 2004 Annual Survey of Hours and Earnings (ASHE). It is observed that average hourly earnings among males are estimated to be £12.58 for males compared to £9.54 for females. Considering relative earnings by age, both age earnings profiles follow a parabolic trajectory (see Figure 1). Both profiles are characterised by relatively high rates of earnings growth during the early working life, followed by stabilisation during middle age and a slight decline in earnings as individuals approach retirement. However, comparisons by age group reveal that women consistently earn less than men during all stages of the life cycle. Abstracting from cohort effects that are embodied within this cross sectional picture of earnings, the size of the gender differential appears to increase with age.

Figure 1: Estimates of the Gender Pay Differential: ASHE 2004



There are several reasons provided for the gender differential in pay. The first is that women may acquire less human capital than their male colleagues. Wages are dependent on individuals' human capital (Becker, 1965). Human capital is accumulated through education, work experience and training. Women who have given birth may have experienced career breaks and could therefore have spent less time in the labour market and suffered a depreciation of their professional skills. Moreover, opportunities for the continued development of human capital, such as training, are likely to be characterised by a degree of continuity in employment (Bishop, 1997). Anticipation of leaving the labour market might discourage both female employees and employers from investing in human capital activities (see for example, Polachek, 2003). Mumford and Smith (2004) note that the size of the gender differential is greater within high wage occupations.

Secondly, women may be relatively constrained in terms of searching for suitable employment, which may contribute to the male-female pay differential. Women, and particularly those with children, may be expected to have preferences for jobs that are compatible with family life (Becker, 1985). Women may therefore be willing to trade off higher earnings to find employment in jobs that offer flexible work arrangements. For example, following periods of family formation women may return to part time employment. Previous analyses have demonstrated that part time employment is associated with a penalty in pay (Ermisch and Wright, 1993; Waldfogel, 1995; Sloane 1994). Analyses have also demonstrated that women display substantial downward occupational mobility during periods of family formation with often only limited recovery (Dex and Shaw, 1986, Elias 1988). This downward mobility is linked to the market segmentation of part time jobs that are relatively concentrated within a relatively narrow range of low skilled occupations, primarily within the personal services.

The importance of family formation on the relative earnings of women is underlined by a variety of studies that have estimated the penalty in pay associated with motherhood. Waldfogel (1997) estimates penalty in pay of 6% for one child and 13% for two or more children. Lundberg and Rose (2000) estimate a penalty in pay of 5% associated with a woman's first birth. Budig and England (2001) estimate a penalty in pay of 3% for one child, 9% for two children and 12% for three or more children. Anderson et al (2003) estimate a 4% penalty in pay associated with each child. Davies and Pierre (2005) conduct analysis for 11 European countries. Significant penalties in pay were estimated to exist within Germany, Denmark, the United Kingdom, Ireland, Spain and Portugal. Although not significant in each case, the presence of one child was estimated to be associated with a penalty in pay of 2-6%, the presence of two children was associated with a penalty in pay of 7-12% and the presence of three or more children was associated with a penalty in pay of 12-18%.

Finally Babcock and Laschever (2003) hypothesise that psychology may account for some of the difference in male and female hourly earnings. They argue that women may earn less than men, simply because they are afraid to ask for more. Women may not feel empowered to negotiate higher wages; they passively accept the wages that are offered to them.

2.3 Workplace Gender Monitoring and Hourly Earnings

In this section we examine the relative earnings women who are employed at workplaces that report that they monitor or review recruitment and selection, promotion and relative pay rates according to gender.

Table 5 presents estimates based upon both the continuous hourly earnings data for individuals in the matched ASHE/WERS sample and hourly earnings derived from banded weekly earnings information collected from the WERS survey of employees. As observed in Table 4 (Part One), average hourly earnings derived from the WERS survey of employees are generally lower than those estimated from the matched ASHE/WERS data. However, both data sources reveal the same general pattern. It can be seen that women based in workplaces that monitor for gender equality earn more than those who do not. The effect on earnings is relatively large among those workplaces that explicitly monitor relative pay rates and promotions by gender. However, in each case it is also observed that men who work in such organisations also earn more than men who do not and that the gender differential in hourly earnings is greater in workplaces in workplaces with monitoring procedures in place. Taking the example of monitoring relative rates of pay by gender, based upon the matched ASHE/WERS sample the gender differential is 10 percentage points higher in workplaces that do report that they monitor relative rates of pay by gender (42% compared to 32%).

Table 5: Hourly Earnings and Gender Monitoring Procedures

Monitoring and review procedures undertaken		Male	Female	Male/Female	
Do you monitor recruitment and selection by gender?	ASHE/WERS	Yes	£16.40 (1992)	£11.42 (2319)	143.6
		No	£12.80 (861)	£9.79 (718)	130.7
		Yes	£14.50 (3496)	£11.09 (4628)	130.7
		No	£12.18 (5190)	£9.23 (5238)	131.9
	WERS	Yes	£14.50 (3496)	£11.09 (4628)	130.7
		No	£12.18 (5190)	£9.23 (5238)	131.9
		Yes	£16.63 (1551)	£11.80 (1730)	140.9
		No	£13.74 (1302)	£10.02 (1307)	137.1
Do you review recruitment and selection procedures to identify indirect discrimination by gender?	ASHE/WERS	Yes	£16.63 (1551)	£11.80 (1730)	140.9
		No	£13.74 (1302)	£10.02 (1307)	137.1
	WERS	Yes	£15.23 (2778)	£11.13 (3577)	136.8
		No	£12.12 (5908)	£9.52 (6289)	127.3
Do you monitor promotions by gender?	ASHE/WERS	Yes	£17.56 (1149)	£12.21 (1378)	143.8
		No	£13.79 (1302)	£10.06 (1659)	137.1
		Yes	£16.16 (1660)	£11.87 (2232)	136.1
		No	£12.40 (7026)	£9.59 (7634)	129.3
	WERS	Yes	£16.16 (1660)	£11.87 (2232)	136.1
		No	£12.40 (7026)	£9.59 (7634)	129.3
		Yes	£17.54 (1232)	£12.29 (1376)	142.7
		No	£13.63 (1621)	£10.00 (1661)	136.3
Do you review promotion procedures to identify indirect discrimination by gender?	ASHE/WERS	Yes	£17.54 (1232)	£12.29 (1376)	142.7
		No	£13.63 (1621)	£10.00 (1661)	136.3
	WERS	Yes	£15.82 (1715)	£11.34 (2267)	139.5
		No	£12.45 (6971)	£9.74 (7599)	127.8
Do you review relative pay rates by gender?	ASHE/WERS	Yes	£18.15 (1260)	£12.76 (1207)	142.2
		No	£13.06 (1593)	£9.90 (1830)	131.9
		Yes	£17.35 (1525)	£12.55 (1471)	138.2
		No	£12.21 (7161)	£9.67 (8395)	126.3
	WERS	Yes	£17.35 (1525)	£12.55 (1471)	138.2
		No	£12.21 (7161)	£9.67 (8395)	126.3

2.4 *Identifying the Effects of Monitoring on the Gender Wage Differential: Empirical Approach*

The descriptive analysis presented in Table 5 suggested that the gender wage gap was *higher* in those workplaces where managers reported that they explicitly monitored and reviewed recruitment and selection, promotion and relative rates of pay by gender. However, a variety of personal and workplace characteristics will determine hourly earnings, potentially confounding the descriptive analysis presented above. For example, the characteristics of employees who choose to work in workplaces that monitor for gender equality could be different to those who do not. Women who have had children may prefer to work in organisations that are more ‘family friendly’. The interrupted careers of such women or differences in the types of jobs available in such organisations (e.g. part time employment), could be associated with the relatively low earnings of women in such workplaces, despite the presence of gender monitoring procedures.

To identify the separate and additional effect of monitoring procedures on the gender wage differential, we introduce variables to identify the presence of such procedures at the workplace in to a wage function. We estimate models of the following general form:

$$\ln W = \beta_0 + \beta_1 Q_i + \beta_2 ?_j + e_i$$

where natural logarithm of gross hourly wages (W) is modelled as a function of a variety of individual and workplace characteristics (Q_i). Separate models are estimated based upon the matched ASHE/WERS dataset, where the dependent variable is based upon the continuous hourly earnings information available from ASHE, and for the WERS data set, where the dependent variable is derived from the banded weekly earnings information collected from the WERS survey of employees¹⁰.

The advantage of the matched data set is the accuracy of the earnings information. This disadvantage of this source is the limited number of variables that can be introduced to control for personal characteristics. Full details of the explanatory variables included within the regression analysis are provided in Annex A. In the ASHE/WERS analysis, the personal characteristics for which we introduce controls include gender, age, hours worked, tenure, enterprise size, whether wages are set by collective agreement, region, industrial sector and occupation. In the WERS based analysis, richer information about personal characteristics can be included. These include, gender, age, hours worked, tenure, marital status, family status (dependent children), ethnicity, highest level of educational attainment and trade union membership. Both models include the same control variables for workplace characteristics, as derived from questions included in the WERS Managerial Questionnaire. Specifically, we control for size of workplace, whether the workplace is part of a multi-site enterprise, ownership status, the nature of negotiations with trade unions, wage setting arrangements, region and industry. Where both the WERS

¹⁰ Hourly earnings from the WERS employee survey have been derived by taking the mid-point of each wage band and dividing by the number of hours worked per week.

and the ASHE data sets provided the same information, information from the source providing the most detailed or reliable information was included within the analysis.

In each of our models, the coefficients of interest are those associated with the presence of gender monitoring and how these policies affect the relative earnings of females. For each data source, we firstly estimate a simple gender pay differential using a 0/1 dummy variable. We then replace this variable with dummy variables that differentiate between men and women working in monitoring and non-monitoring workplaces. Separate models for each of the five reported methods of monitoring are estimated. Models are estimated using Ordinary Least Squares¹¹, with robust standard errors being used to adjust for clustering of observations.

2.5 Regression Results

Results from the regression analyses are presented in Table 6. We begin by examining a purely gender pay differential, comparing results based upon the matched ASHE/WERS data and WERS data. Considering the matched data, it is estimated that the hourly earnings of women are 14.5% less than those of men after having controlled for other observable personal and workplace characteristics. This is consistent with a gender wage gap based upon the full ASHE sample (not reported) of 14.7%. Utilising the WERS data, we estimate the size of the gender wage gap to be 17.5%. This differential is larger than the ASHE/WERS based estimate and is consistent with previous estimates (e.g. 18.6%, Booth et al (2005) and 17.6%, Walby and Olsen (2002)).

It is suspected that the lower gender differential estimated based upon the ASHE/WERS data reflects the inclusion of occupational dummy variables as explanatory variables in the absence of any direct measures of human capital contained in this data source. As occupation will be an outcome of the choices facing women given their family circumstances and levels of human capital, utilising occupation as an explanatory variable will result in the gender variable capturing less of the earnings differential between males and females. The higher explanatory power of the ASHE/WERS model also suggests that this specification could be controlling for 'too much' in terms of estimating the 'true' scale of the gender wage gap. Whilst estimates of the gender differential based on the ASHE/WERS data may be biased downwards, it is noted that the primary interest is in the relative size of these differentials according to whether or not workplaces have gender monitoring arrangements in place.

¹¹ We are unable to use sample selection methods (e.g. Heckman) as all employees in our sample are in work.

Table 5: Regression Results

Monitoring and review procedures undertaken	Coefficient	Data Source	
		ASHE/WERS	WERS
Basic Model	Female	-0.145*	-0.175*
		(0.014)	(0.010)
	Obs	5586	18420
	R2	0.64	0.36
Do you monitor recruitment and selection by gender?	Male - Monitoring	0.005	0.046*
		(0.021)	(0.019)
	Male – No Monitoring	ref	ref
	Female – Monitoring	-0.126*	-0.116*
		(0.021)	(0.018)
	Female - No Monitoring	-0.179*	-0.185*
		(0.022)	(0.014)
	Obs	5586	18420
R2	0.640	0.36	
Do you review recruitment and selection procedures to identify indirect discrimination by gender?	Male - Monitoring	0.022	0.049*
		(0.018)	(0.019)
	Male – No Monitoring	ref	ref
	Female – Monitoring	-0.119*	-0.124*
		(0.019)	(0.019)
	Female - No Monitoring	-0.148*	-0.176*
		(0.021)	(0.012)
	Obs	5586	18420
R2	0.640	0.36	
Do you monitor promotions by gender?	Male - Monitoring	0.034	0.062*
		(0.018)	(0.024)
	Male – No Monitoring	ref	ref
	Female – Monitoring	-0.100*	-0.098*
		(0.019)	(0.018)
	Female - No Monitoring	-0.153*	-0.178*
		(0.018)	(0.011)
	Obs	5586	18420
R2	0.640	0.36	
Do you review promotion procedures to identify indirect discrimination by gender?	Male - Monitoring	0.087*	0.055*
		(0.018)	(0.023)
	Male – No Monitoring	ref	ref
	Female – Monitoring	-0.107*	-0.114*
		(0.019)	(0.019)
	Female - No Monitoring	-0.146*	-0.177*
		(0.018)	(0.012)
	Obs	5586	18420
R2	0.640	0.36	
Do you review relative pay rates by gender?	Male - Monitoring	0.087*	0.105*
		(0.018)	(0.023)
	Male – No Monitoring	ref	ref
	Female – Monitoring	-0.063*	-0.076*
		(0.019)	(0.022)
	Female - No Monitoring	-0.138*	-0.173*
		(0.018)	(0.011)
	Obs	5586	18420
R2	0.643	0.36	

We now examine the impact of gender monitoring on the relative earnings of males and females. For each of the gender monitoring procedures, employees are assigned to 1 of 4 categories to indicate men and women who are or are not employed at workplaces that actively monitor each area. The dropped reference category in each case is men who are employed at workplaces that do not monitor gender equality. The results of the multivariate analysis mirror the descriptive analysis of hourly earnings presented in Table 5. That is, whilst women employed in workplaces that monitor gender equality earn more than those employed in workplaces who do not, men employed in these workplaces also earn more. Taking the example of whether workplaces monitor relative rates of pay by gender, males employed in such workplaces earn 8-10% more than those who do not, after controlling for other observable personal and workplace characteristics. Similarly, women employed in such workplaces also earn approximately 7-10% more than those who do not. As a result, the scale of the gender differential in both types of workplace is similar, although both men and women earn more in workplaces that monitor relative rates of pay.

While the results show that women working in organisations that monitor gender equality earn more than those who do not, it does not appear that differences in the hourly earnings of men and women are narrower in workplaces that do monitor gender equality. Table 7 summarizes the differences in hourly earnings between men and women derived from the earnings regressions. It is only among workplaces that monitor recruitment and selection and among those workplaces that monitor promotion by gender, where the differential in earnings between males and females is narrower compared to those workplaces that do not undertake such monitoring. Reviewing these procedures to identify indirect discrimination does not appear to be associated with narrower gender differentials. There is some evidence to suggest that monitoring relative pay rates is associated with wider gender differentials.

Table 7: Summary of Gender Differentials in Hourly Earnings

Monitoring and review procedures undertaken?		ASHE/WERS	WERS
Do you monitor recruitment and selection by gender?	Yes	13.1	16.2
	No	17.9	18.5
Do you review recruitment and selection procedures to identify indirect discrimination by gender?	Yes	14.1	17.3
	No	14.8	17.6
Do you monitor promotions by gender?	Yes	13.4	16.0
	No	15.3	17.8
Do you review promotion procedures to identify indirect discrimination by gender?	Yes	19.4	16.9
	No	14.6	17.7
Do you review relative pay rates by gender?	Yes	15.0	18.1
	No	13.8	17.3

3. Concluding Comments

The paper has presented evidence of the impact of workplace monitoring and review procedures on the wages of both female and male employees and how such policies affect the gender gap in earnings. Our results draw two main conclusions. Firstly, our estimates suggest that women who work at organisations that implement monitoring procedures have higher hourly earnings than women who do not. However, men

working in such organisations also earn more than those who do not. Therefore, while there is some evidence to suggest that the gender pay gap is narrower among those employed at workplaces that monitor recruitment, selection, and promotion issues by gender, the general effect of such policies on the gender pay differential is inconclusive. Using data from WERS98, Mumford and Smith (2004) find a significant within-workplace and within-occupation gender specific pay differential, and propose strengthening equal pay legislation to eliminate this source. Our results suggest that monitoring equal opportunities may have little impact on narrowing wages between men and women where these policies are implemented.

There are a number of caveats to this analysis. For example, wages of both men and women are generally higher for those working in large organisations; where the organisation is foreign owned; where family friendly policies are present and regulation interactions between employees and their managers occur (Mumford and Smith, 2007). Our analysis has confirmed that earnings are higher in those organisations that have monitoring procedures in place. In looking at the gender earnings gap in among such workplaces, we are focussing on individuals higher up the earnings distribution. Previous analyses have suggested that gender gap in pay is larger at the higher end of the income distribution (Booth et al 2005, Manning and Swaffield, 2005). Our analysis may reveal that such monitoring procedures may be having an effect, insofar that the gender differential is not higher in workplaces that are generally characterised by higher earners.

It is also noted that the analysis is not necessarily comparing men and women who work in the same workplace. We have observed that among a cross-section of workplaces, gender differentials are as wide among those workplaces that have gender monitoring arrangements than those who do not. From a policy perspective, empirical result could have been obtained in a fully segregated labour market, where men and women work in completely different workplaces¹². Within such a labour market, the introduction of equal opportunities monitoring would not be expected to reduce wage discrimination within the workplace. However, they may lead to a reduction in the overall gender wage differential if their presence encouraged the recruitment of women in to high wage workplaces, altering the composition of female employment. Panel data techniques would be required to accurately determine whether the introduction of equal opportunities monitoring policies had an impact on the gender differential before and after their implementation.

In conducting this analysis, we have utilised information from a new innovative data source that merges workplace characteristics from WERS on to detailed information on the earnings of individuals included in the ASHE who have been identified as working in WERS workplaces. The benefit of the matched data set is that it has enabled us to examine the robustness of our results by utilising an alternative source of information on the earnings of those employed in WERS workplaces. Whilst we have focussed on the effects of gender monitoring policies, merging workplace data on to ASHE has a variety of potential applications. For example, the extent of provision of childcare, training and development, and grievance procedures, are all documented and can now be incorporated into analysis of wage information contained within ASHE. It should also be noted that the ASHE data set has a panel design. It is

¹² We are grateful to John Forth for this observation.

therefore possible to follow the careers of those contained in the matched ASHE/WERS data set in subsequent years of ASHE. This could provide a valuable opportunity to consider how employment relation practices at the workplace relate to subsequent earnings, hours, retention, occupational choice and geographical mobility.

Annex: Control Variables Used in Regression Analyses

<p>Personal characteristics from ASHE:</p> <p>Age: Dummy variables for ages 16-21, 22-30, 31-40, 41-50, 51-55, 56-65, 65+</p> <p>Occupation: Dummy variables based on sub-major groups of SOC2000 (2 digit level)</p> <p>Tenure: Dummy variables for up to 1 year, 1-5, 6-10, 11-20, 20-40, 40+</p> <p>Hours: Dummy variables for 1-15, 16-20, 21-25, 26-31, 32-36, 37-40, 41-45, 51-55, 56-60, 61+</p> <p>Loss of pay: Marker indicating whether loss of pay due to absence</p>	<p>Personal characteristics from WERS:</p> <p>Age: Dummy variables for ages 18-19, 20-21, 22-29, 30-39, 40-49, 50-59, 60-64, 65+</p> <p>Tenure: Dummy variables for < 2yrs, 2-5yrs, 5-10yrs, greater than 10yrs</p> <p>Hours of work: Dummy variables for 16-22, 21-25, 26-31, 37-40, 41-45, 46-50, 51-55, 56-60, 61+</p> <p>Trade union member: Dummy variables for member, used to be a member, never been a member</p> <p>Ethnicity: Dummy variables for White, Mixed, Black, Asian, Chinese, other</p> <p>Highest educational qualification: Dummy variable based on 5 NVQ Equivalents</p> <p>Family Status: Dummy variables for single, widowed, married, divorced.</p> <p>Dependent children: Dummy variable for age of youngest child: 0-2, 3-4, 8-11, 12-18</p>
<p>Workplace characteristics: ASHE</p> <p>Type of collective agreement: Dummy variables differentiating between national, local, company, workplace, other and no collective agreement</p> <p>Employment size: Size bands for enterprise size from IDBR <20, 20-50, 50-100, 100-500, 500-1000, 1000+</p> <p>Public/private sector:</p> <p>Sector: Dummy variables for 12 broad industry sectors</p> <p>Region: Dummy variables for Government Office Region</p>	<p>Workplace characteristics: WERS</p> <p>Sector: Dummy variables for 10 broad industry sectors</p> <p>Region: Dummy variables for Government Office Region</p> <p>Size: Number of employees at workplace <50, 50-100, 100-500, 500-1000, 1000-2000, 2000-5000, 5000-10000, 10000+</p> <p>Foreign ownership: Workplace wholly owned in UK, mostly owned in UK, half owned in UK-half foreign owned, mostly owned by foreign, wholly owned by foreign</p> <p>Union negotiation: workplace negotiates with union in wage setting, workplace consults with union in wage setting, no dealings with union, workplace does not inform union of wage setting, workplace informs union of wage setting decision</p> <p>Workplace age: up to 5yrs, 5-9yrs, 10-14yrs, 15-20yrs, 20-25yrs, 25+yrs</p> <p>Pay Setting: wages set by collective wage agreement at national level, collective wage agreement at organisational level, collective wage agreement at workplace level, organisation management, workplace management, independent pay review body</p>

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